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AUSTRALIAN CENTRE
FOR
ECONOMIC RESEARCH
ON HEALTH

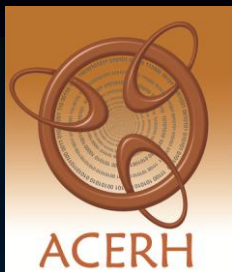
The impact of chronic hepatitis B in Australia: Projecting mortality, morbidity and economic impact

James RG Butler, Rosemary J Korda,
Katrina JR Watson & D Ashley R Watson

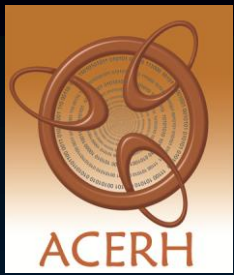


THE UNIVERSITY OF
WESTERN AUSTRALIA

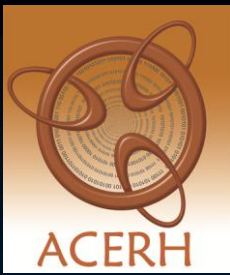




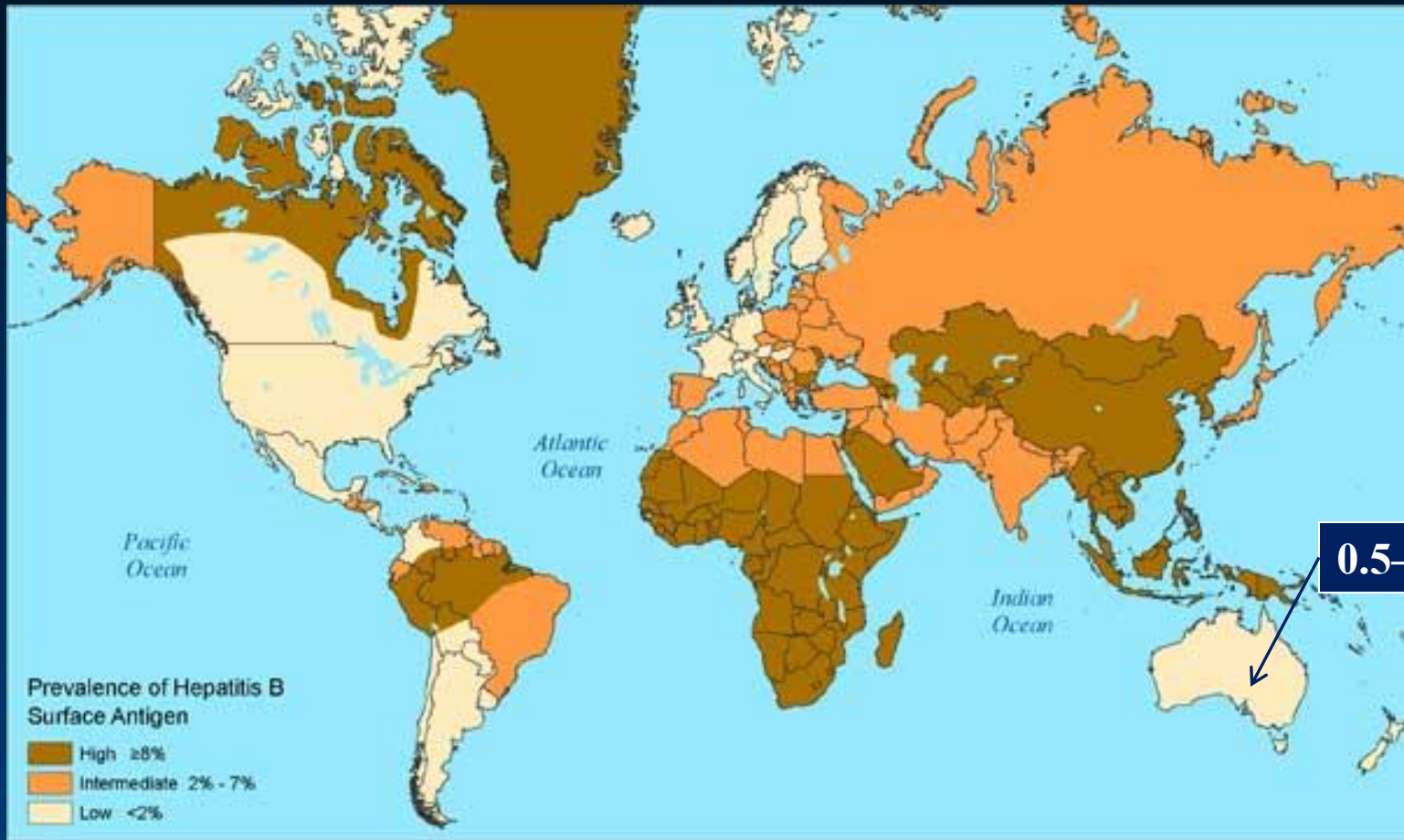
- **Overview of chronic hepatitis B**
- **Modelling the burden of chronic hepatitis B**
- **Results**
 - **Epidemiological burden**
 - **Economic burden**
 - **Cost-effectiveness of enhanced management and treatment**
- **Investment in a National Strategy for Hepatitis B**



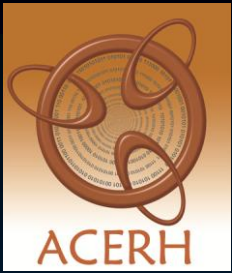
Overview of chronic hepatitis B



Prevalence of chronic infection with hepatitis B virus

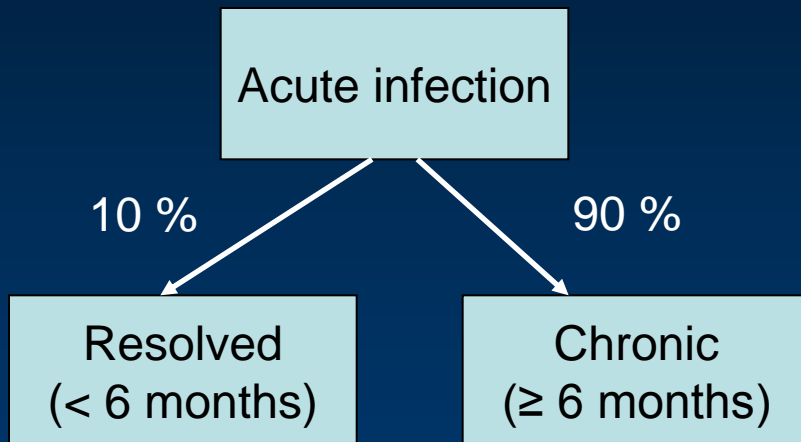


= ~ 200,000 people in Australia with chronic HBV infection

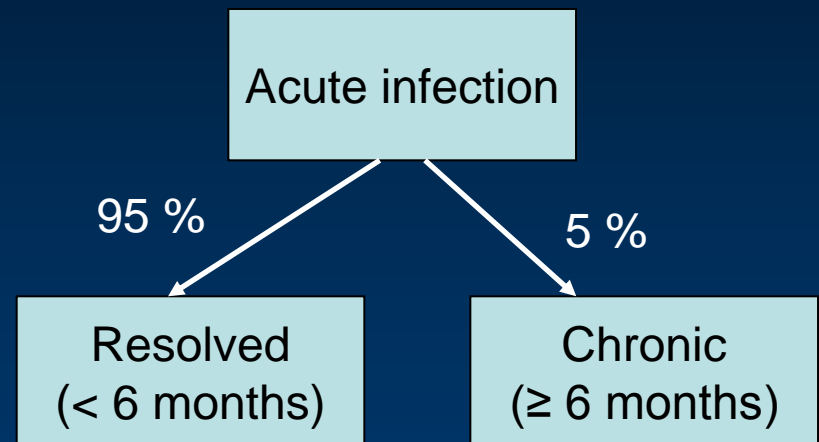


Acute vs chronic HBV infection

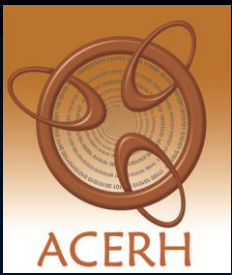
Neonates



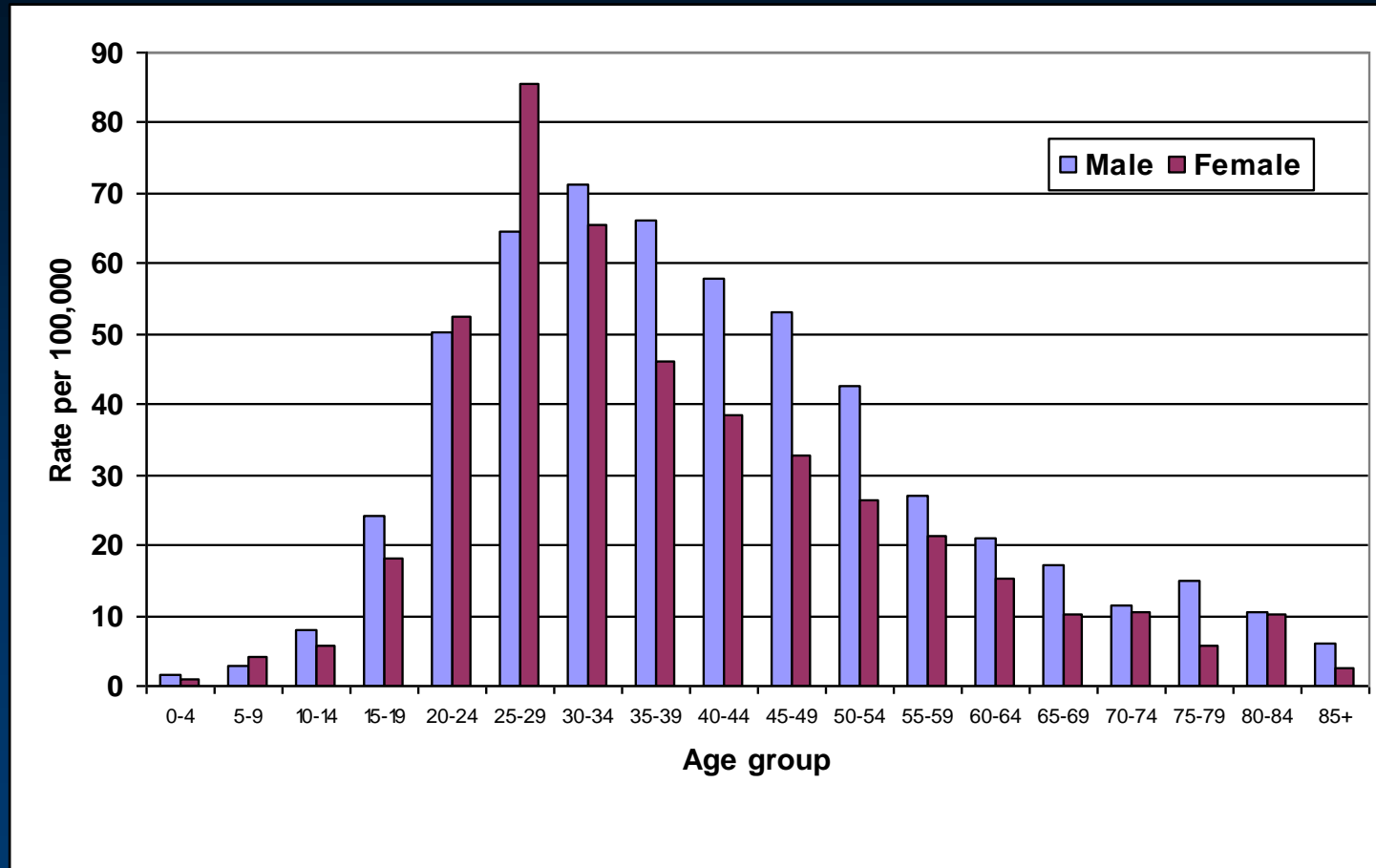
Adults



Estimated rate of new cases of chronic HBV infection in Australia per year:
55 per 100,000



Notification rates for chronic HBV infection, by age group and sex, 2007

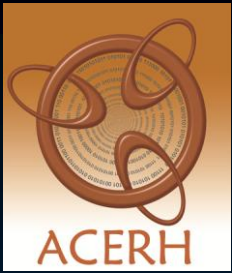


Data source: National Notifiable Diseases Surveillance System, Australian Government Department of Health and Ageing (2008)

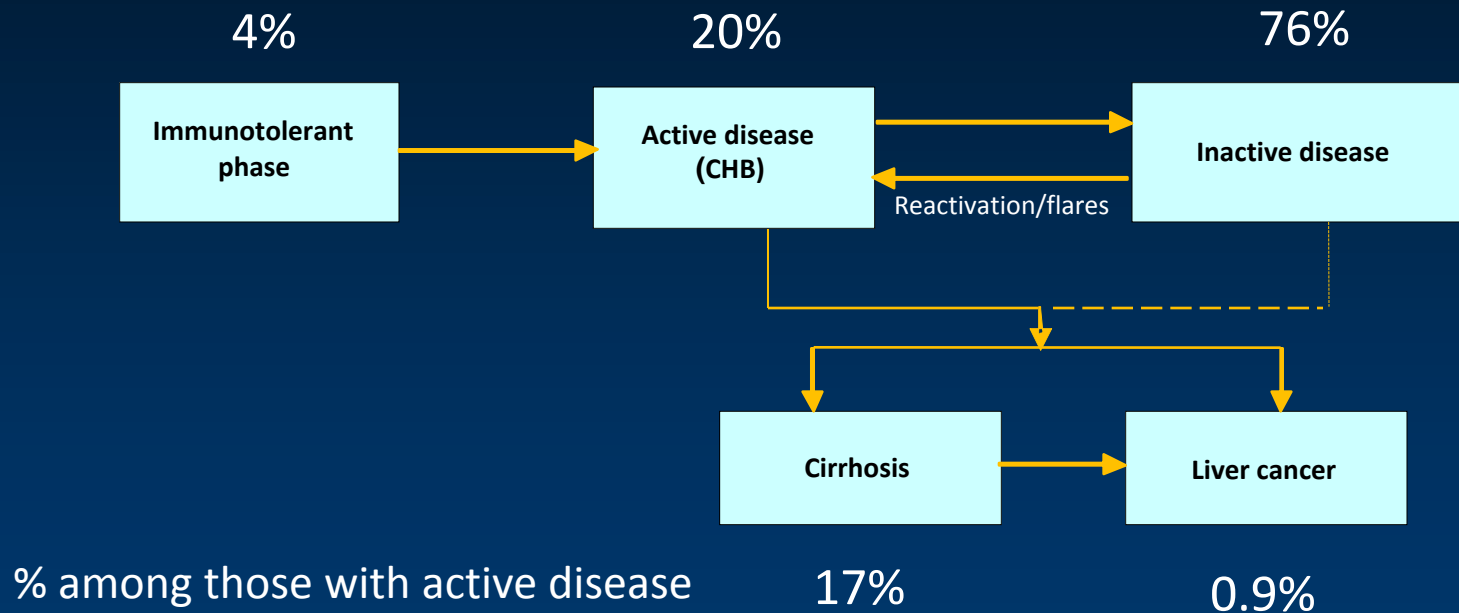


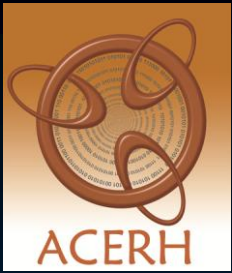
High-risk groups in Australia include:

- **People born in high-endemicity countries**
Asia-Pacific ~ 50% of cases
- **Indigenous people**
~ 16% of cases
- **Injecting drug users**
- **Men who have sex with men**



The main phases of chronic hepatitis B





Treatment for chronic hepatitis B (active disease)

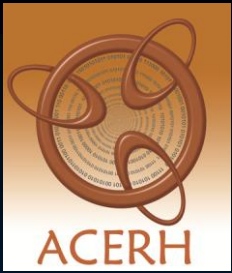
Drug therapy

- Anti-viral agents
- Immunomodulating drugs
- Aims:
 - to suppress viral replication
 - to stop or reduce liver damage, i.e. cirrhosis and liver cancer
- In 2008:
 - 4,784 person-years of drug treatment
 - 13% of those with CHB treated at any one time

Liver transplantation (9 patients in 2007)

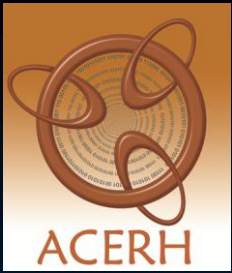


Modelling the burden of chronic hepatitis B



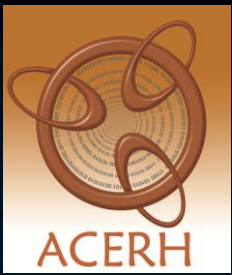
Modelling the burden of chronic HBV infection in Australia

- **Markov model**
 - Epidemiological and economic burden
 - Current and over next decade (2008 – 2017)
- **Three scenarios**
 - Scenario I – Natural History (no drug therapy)
 - Scenario II – Current management and treatment practices (13% of CHB on drug therapy)
 - Scenario III – Increasing the proportion treated (41% of CHB on drug therapy)

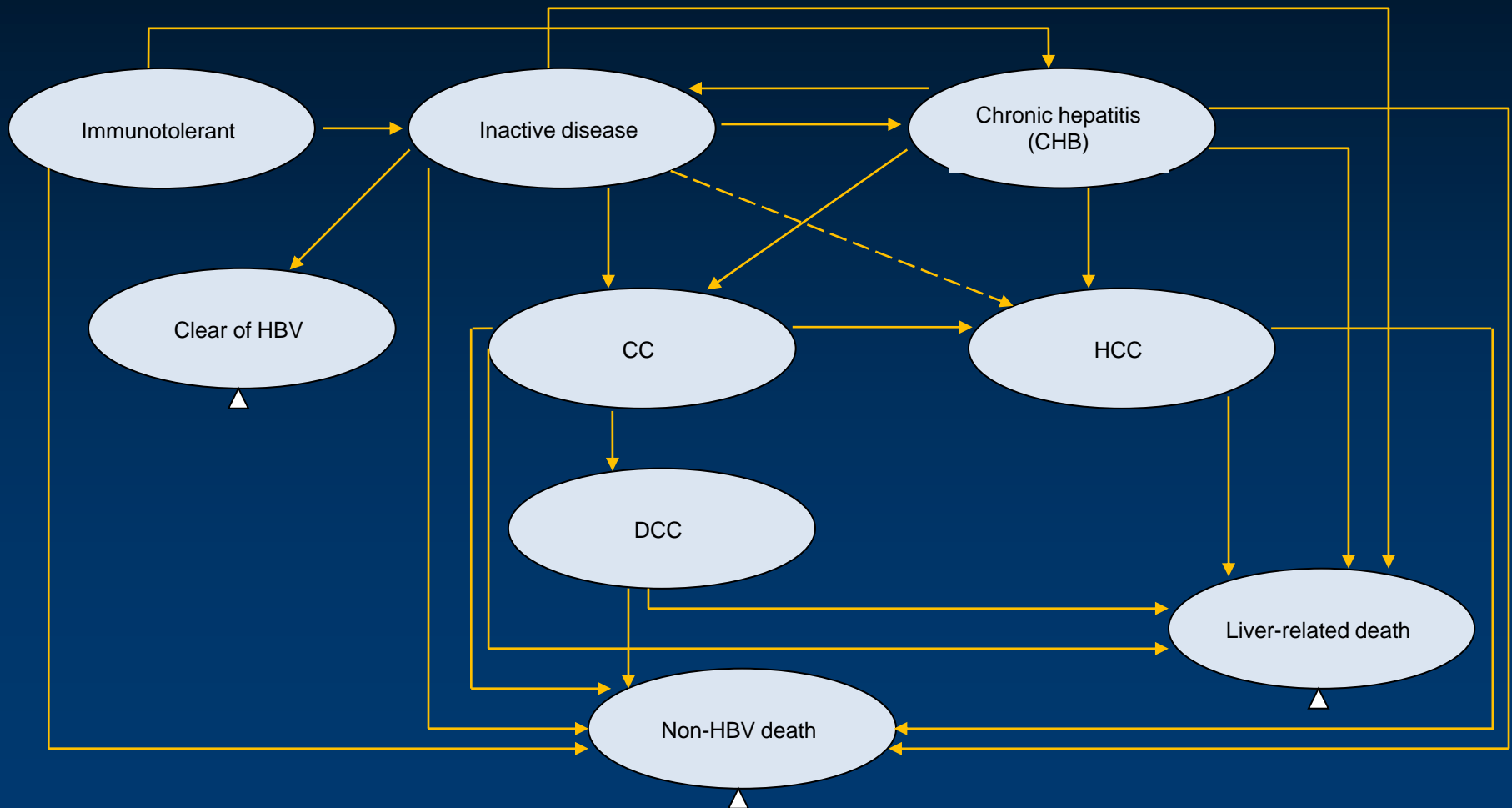


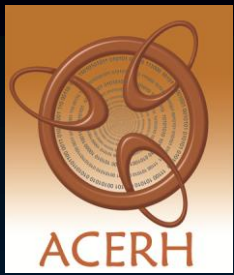
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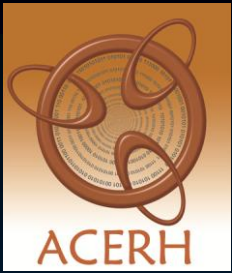


Markov-state diagram of the natural progression of CHB infection



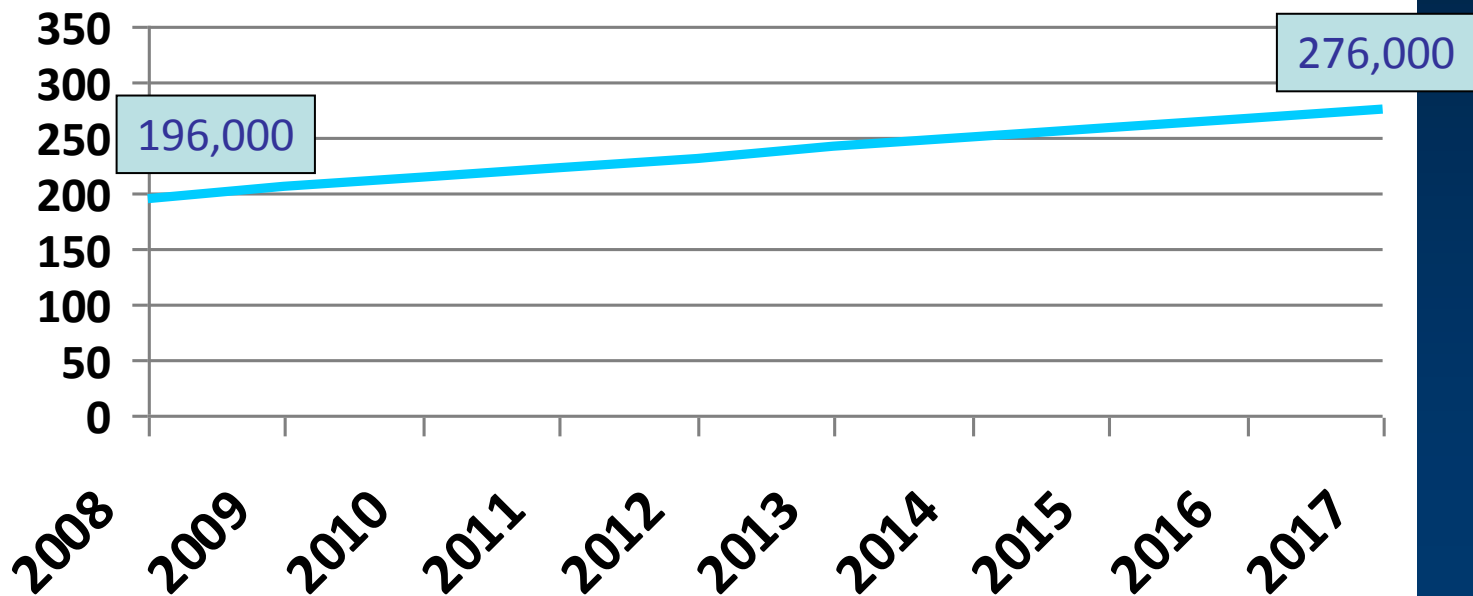


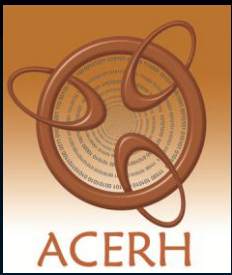
Results – Epidemiological Burden



Epidemiological burden 2008–2017: chronic HBV infection

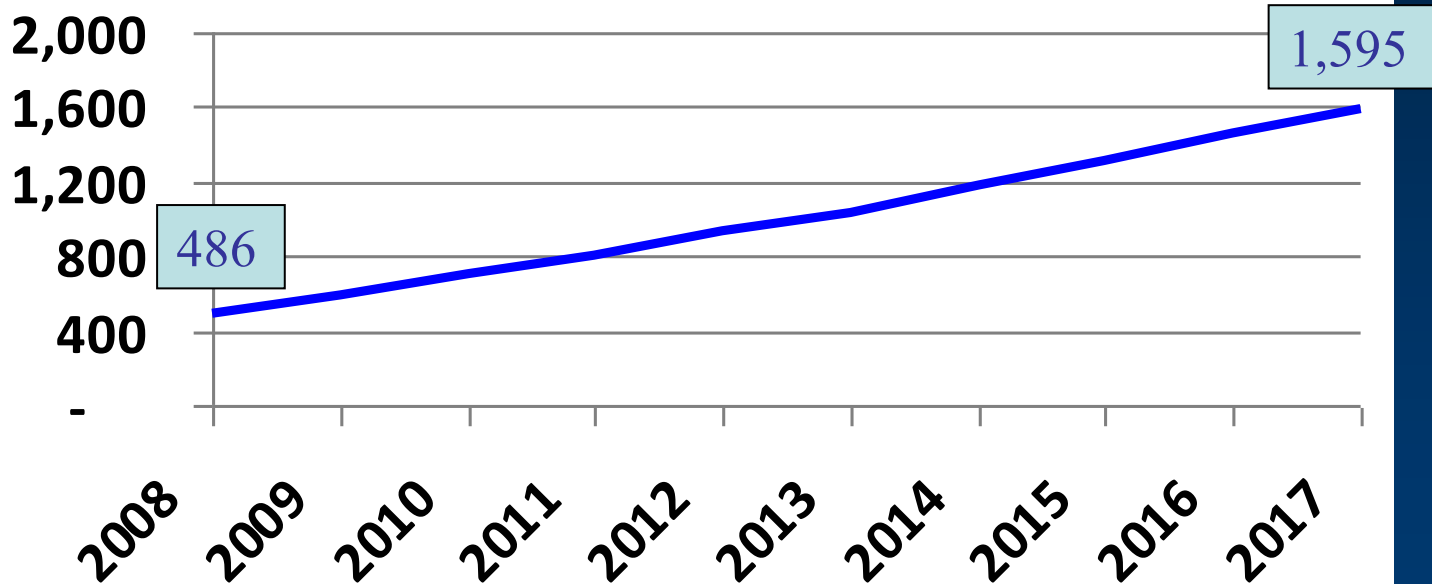
Number of people living with chronic HBV-
infection each year (x1,000)

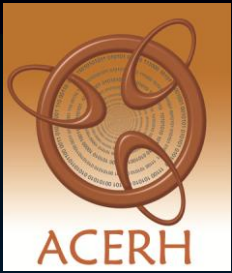




Epidemiological burden 2008–2017: chronic HBV infection

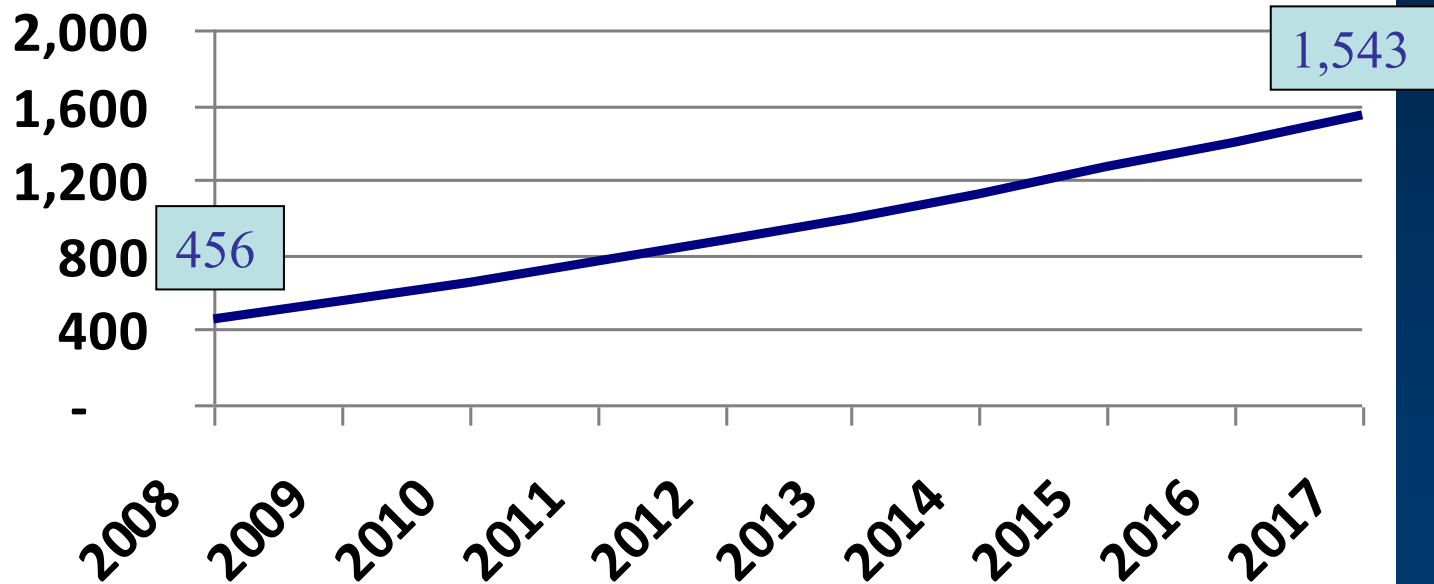
Number of people living with HBV-related
liver cancer each year

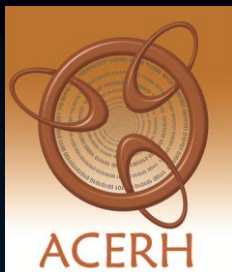




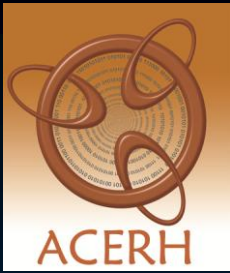
Epidemiological burden 2008–2017: HBV-related deaths

Annual number of HBV-related deaths





Results – Economic Burden



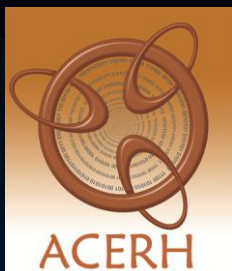
Economic Burden

Research question:

- What will be the cost of managing and treating HBV infection from 2008 to 2017 under:
Scenario I (natural history – no treatment)
Scenario II (current treatment – 13% of CHB treated)
Scenario III (enhanced treatment – 41% treated)?

Require:

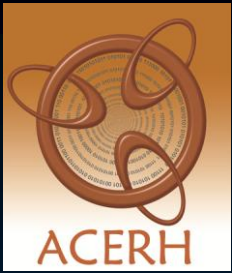
- Projections of numbers of cases by HBV disease state
- Unit costs of management and treatment by HBV disease state



Unit costs of management and treatment by HBV disease state (per annum)

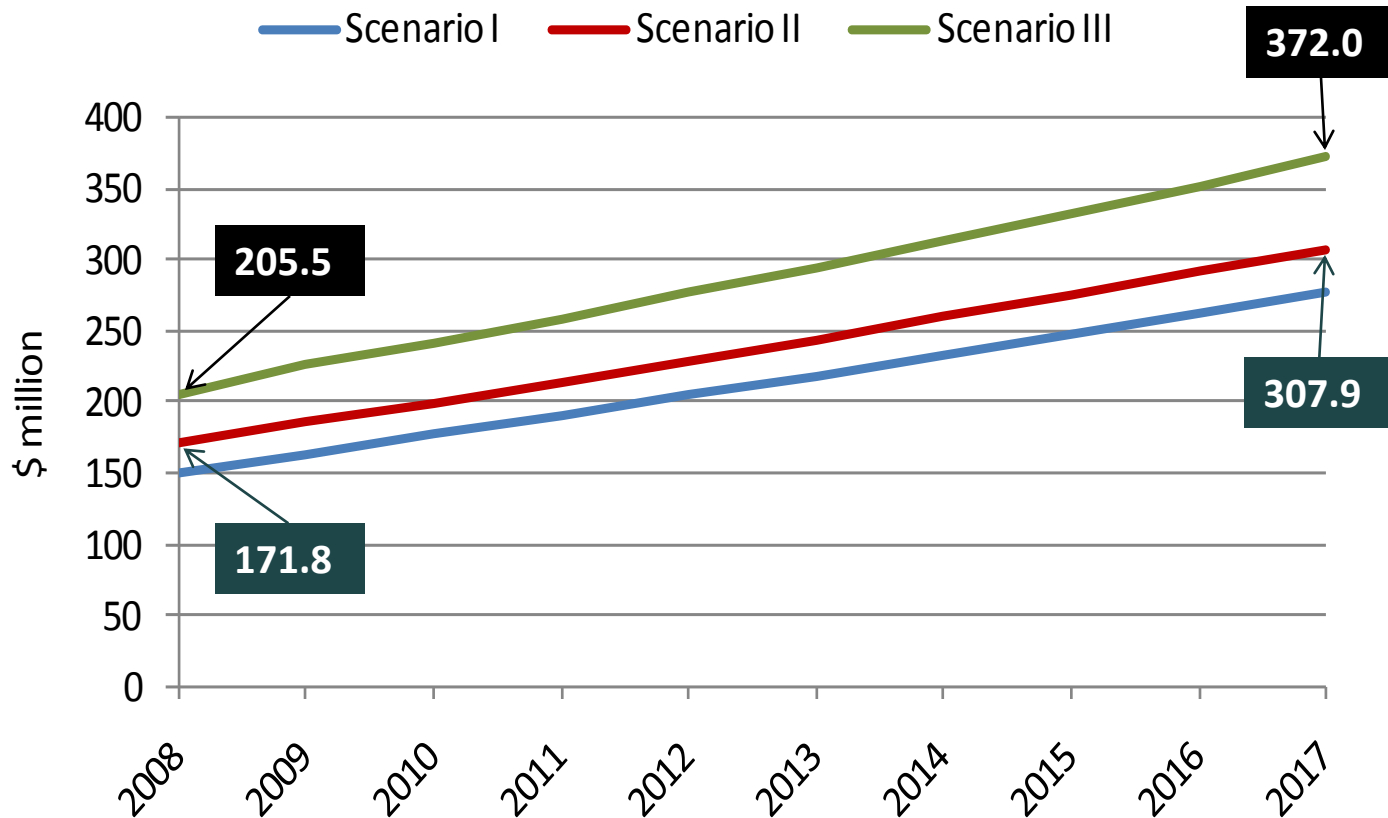
	Butler <i>et al</i> (2004) – CPI adjusted		Updated HBV testing and treatment costs			Updated total costs	
	Total	HBV drugs and DNA tests	HBV DNA tests – no R _x	HBV DNA tests – on R _x	HBV drugs	Total – no R _x	Total – on R _x
	(A)	(B)	(C)	(D)	(E)	(A–B+C)	(A–B+D+E)
Inactive CHB	931	519	153	n.a.	n.a.	565	n.a.
Active CHB	2,189	1,413	153	612	4,614	1,199	6,272
CC	1,715	791	153	612	4,614	1,077	6,150
DCC	14,714	1,063	153	612	4,614	13,804	18,877
HCC	14,459	705	153	612	4,614	13,906	18,979

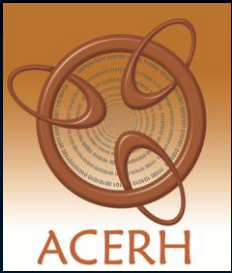
Liver transplant – year 1: \$177,631; Liver transplant – year 2+: \$28,491
 Palliative care: \$7,759 (received by 68% of liver cancer patients)



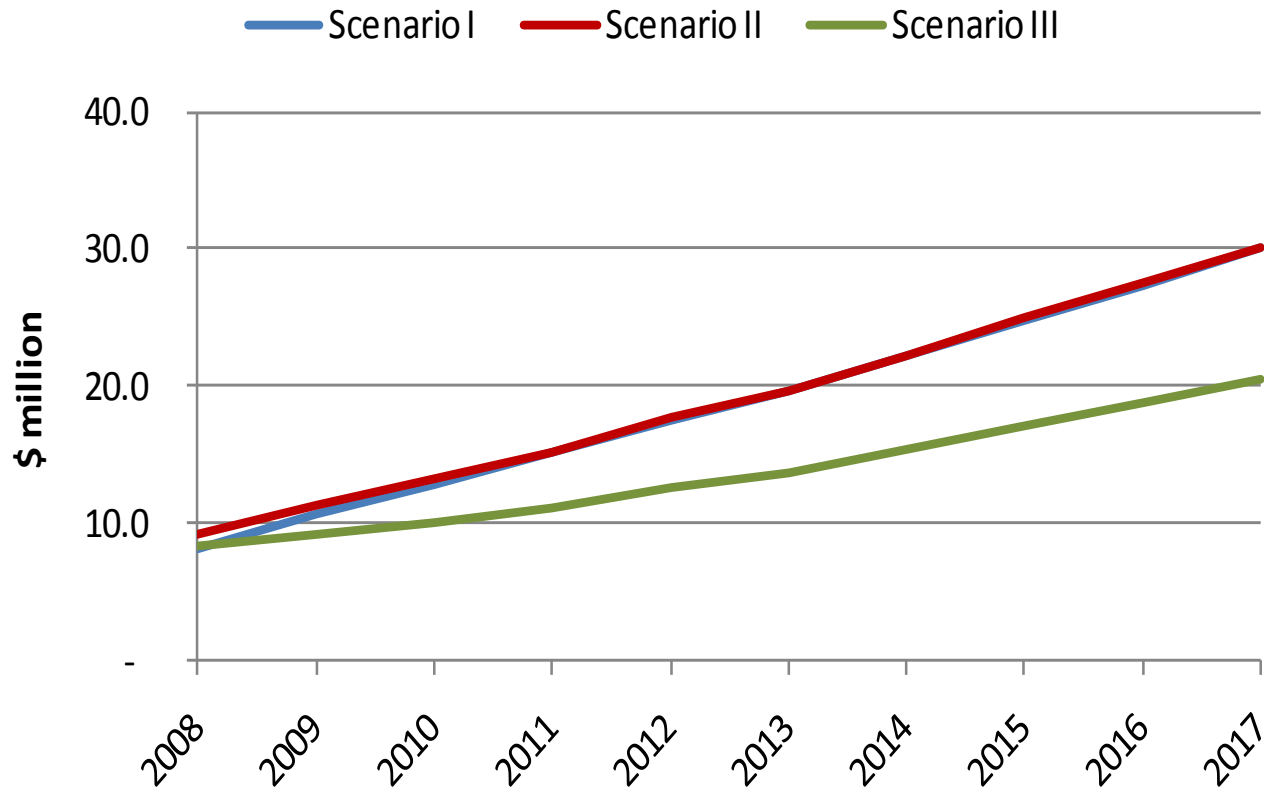
Projected costs of treatment – 2008 to 2017

	10-year total	Δ
SI	\$2,123.9m	
SII	\$2,377.5m	\$253.6m
SIII	\$2,876.0m	\$498.5m



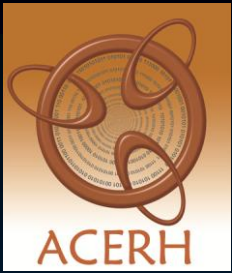


Projected annual cost of treatment for HBV-related liver cancer – 2008 to 2017





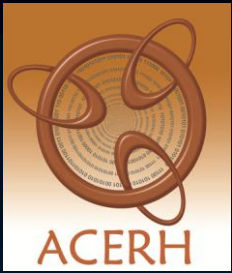
Results – Cost-effectiveness of enhanced management and treatment



Cost-effectiveness of enhanced management and treatment (SIII vs SII)

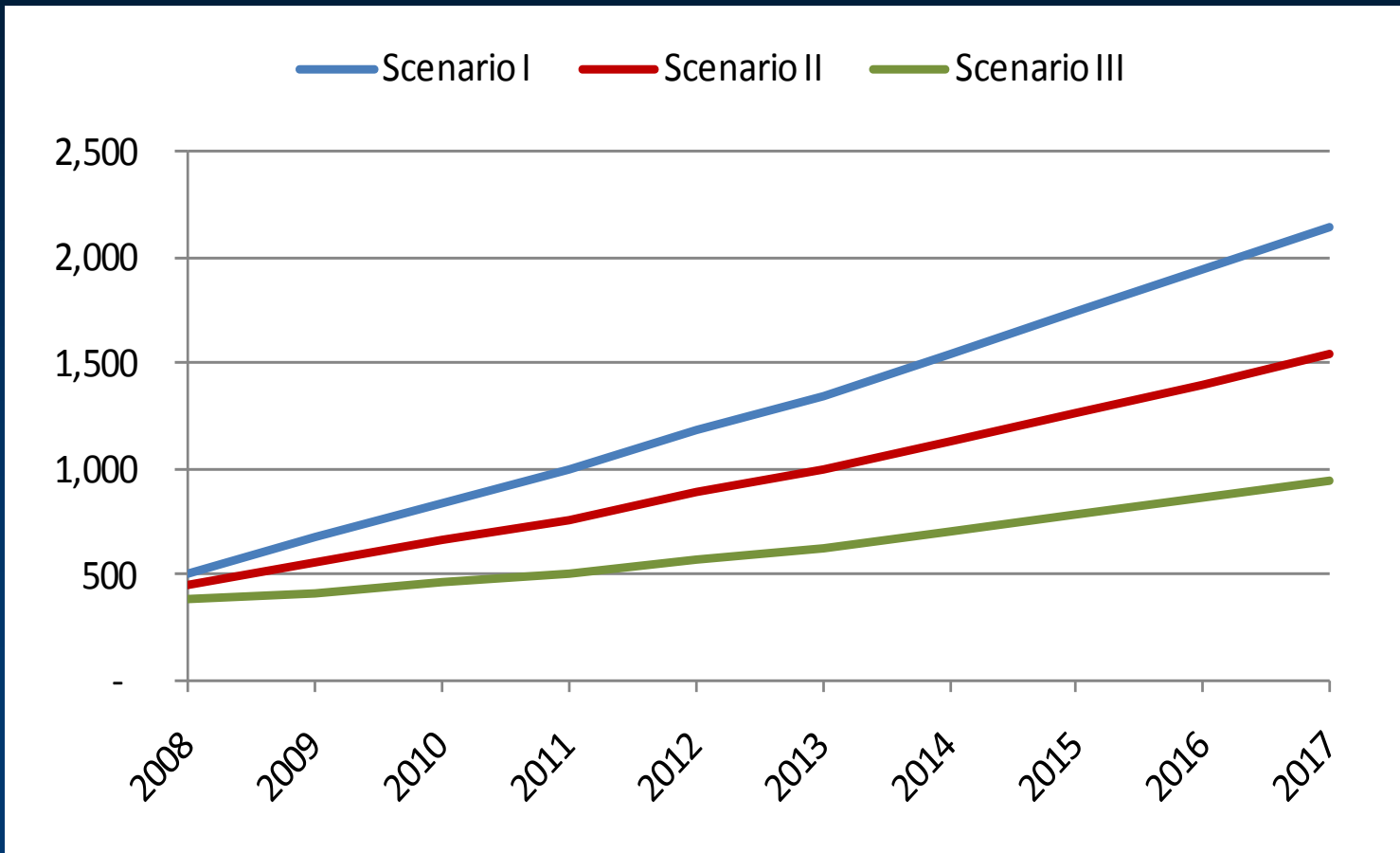
Health outcomes

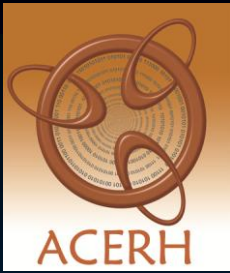
- Mean age at death from HBV (Aust 2005) = 56.2 years
- Life expectancy at age 56 years = 27.0 years
- Weight applied to life expectancy = 0.34
[Duration weight = 0.50, QoL weight = 0.68, (0.5 x 0.68 = 0.34)]
- Discount rate = 5% per annum
- Applied to all HBV-related deaths averted from 2008 to 2017 attributable to SIII



How many HBV-related deaths are averted?

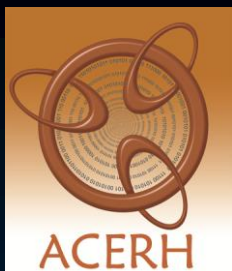
	10-year total	Δ
SI	12,902	
SII	9,643	3,259
SIII	6,272	3,371





Cost-effectiveness results – base case

	Undiscounted	Discounted (r = 5%)
Health outcomes		
Number of HBV-related deaths – Scenario II	9,643	
Number of HBV-related deaths – Scenario III	6,272	
Number of HBV-related deaths averted	3,371	2,547
Number of life-years saved	30,947	13,313
Costs of management and treatment		
10-year cost of management and treatment — SII	\$2,377.5m	
10-year cost of management and treatment — SIII	\$2,876.0m	
Incremental cost of Scenario III (\$m)	\$498.5m	\$393.7m
Incremental cost-effectiveness ratios (ICERs)		
Incremental cost per HBV-related death averted	\$147,873	\$154,603
Incremental cost per life-year saved	\$16,108	\$29,575

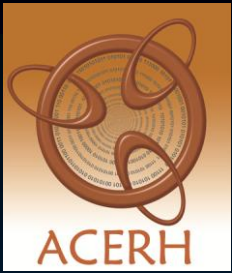


Cost-effectiveness results – sensitivity analyses

All results discounted at 5% per annum	Cost per death averted	Cost per life-year saved
Base case	154,603	29,575
1. Allow for direct progression from inactive disease to liver cancer (base case – no direct progression)	154,953	29,642
2. Weight of 0.75 applied to high endemicity model (base case – 0.50)	164,625	31,492
3. Duration/QoL weight applied to life-years saved (base case – 0.34)		
0.25	n.a.	40,221
0.50	n.a.	20,111



Investment in a National Strategy for Hepatitis B



Cells in this table show minimum economically justified investment in a National Strategy over and above incremental treatment costs (\$m)

Incremental cost per LYS (SIII vs SII) (\$)	Maximum willingness-to-pay for one LYS (\$)			
	40,221	42,000	57,000	108,000
20,111	393.7	428.5	722.2	1,720.7
29,575	141.7	165.4	365.1	1,044.1
31,492	106.6	128.4	311.6	934.7
40,221	0	17.4	164.2	663.5